CANDLEPOWER®

NHTSA, Docket Management Facility
US D.0.T
400 7 St SW, Rm PL-401
Washington DC 20590-001

Re: DOT Docket 15651

26 September 2003

Messrs. Van Iderstine, Cole, et al:

This is by way of response to the above referenced docket, in which your agency requests comment regarding compliance of aftermarket vehicle lighting equipment. Candlepower, as a supplier of light sources and devices, is pleased to have the opportunity to comment on this matter.

As we understand the issue, your agency wishes input on whether the requirement contained in FMVSS No. 108 for replacement equipment to be "identical" to original equipment should be confined to the presence and performance-based compliance of each required function, or whether the identicality requirement should also extend to all aspects of design and construction. This is a critical question with potentially significant impacts on the current and future safety performance of vehicle lighting and signalling equipment.

A major part of Candlepower's expertise is in light sources, i.e., bulbs, LEDs and arc burners. Over the last five years, we have seen progress in light source technology accelerate at an unprecedented fast pace. Many new light sources have been developed and commercialized, and these facilitate the design and production of lighting devices offering levels of efficiency, effectiveness and style that would have been difficult or impossible to achieve only a short time ago.

In similar fashion, the engineering technology of lighting devices has rapidly advanced, such that even some of the oldest existing light sources are being widely used in high-performance, advanced lighting devices. Two immediate examples would be H1 and H3, high-output light sources first introduced (for the European market) in the early 1960s, which since their relatively recent addition to Part 564 as acceptable light sources for use in US-market lighting devices are being widely used today in headlamps and fog lamps.

All aftermarket lighting devices, regardless of design, should certainly be required to conform to all applicable requirements contained in FMVSS No. 108 (as amended from time to time). However, it would be potentially disbeneficial to lighting equipment safety performance for NHTSA to require all lighting devices to be identical in every aspect of design and construction to the original equipment it is intended to replace. We understand NHTSA is interested in preventing vehicles in use having their safety

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performance degraded by the installation of lighting devices inferior to original equipment, and this is reasonable. Such a restriction, however, would also tend to prohibit innovation that can provide improvements in safety performance by the installation of lighting devices superior to the original equipment.

We wish to remind the agency of a key advantage of the requirement formerly contained in FMVSS No. 108 for all vehicles to use sealed-beam headlamps of standardized shape, size, mechanical and electrical characteristics: Every vehicle in use was updated to the latest performance improvements each time the headlamps required replacement due to burnout or breakage. This continual updating of vehicles in use ceased when the requirement for standardized headlamps was abandoned. Due to the relatively high cost of engineering, tooling and producing many types of vehicle lighting devices, and the "identicality" requirement currently interpreted as requiring aftermarket lighting devices to be identical in all aspects of design and performance, most vehicle owners are now locked into a specific level of lighting device performance for the entire service life of the vehicle.

NHTSA's recent rulemaking suggests the agency is mindful of the benefits of facilitating the installation of updated lighting devices on vehicles in use. For instance, when Visual/Optical aiming was introduced, the agency decided that should a manufacturer choose to produce a sealed beam producing a VO, VOL or VOR beam pattern, any such sealed beam should still be required to have aiming pads for use with mechanical aiming devices, to maintain compatibility with vehicles in use and the equipment commonly used to service them. Such provisions for the incorporation of updated lighting device technology and performance should be expanded. As lighting devices and light sources with higher efficacy and performance become available, every effort should be made to facilitate the safe and compliant installation of such devices on existing vehicles. It will be beneficial to the safety performance of vehicles in use if NHTSA enacts and interprets regulations to permit existing vehicles to take advantage, to the maximum extent practicable, of advancements in lighting device performance.

Recent developments in lighting device engineering and technology, such as self-contained LED matrices and modular optic systems that can be used in different housings to provide compliant device assemblies for a variety of vehicle models, have made it very much more cost-effective to market replacement lighting devices offering improvements over original equipment. An example would be a major manufacturer's kit of components replacing the HB2 RBHL in MY1998 Ford Focus vehicles with a high-performance H9/H9 projector/projector RBHL system. Such a source change offers the device engineer approximately double the low beam light flux and 40% more high beam light flux compared to the original HB2 light source, facilitating the design of a device with safety performance far exceeding that of the original device. It would be disbeneficial for the agency to preclude such improvements to the safety performance of vehicles in use

through a design-prescriptive requirement for aftermarket devices to be identical to original devices in all respects.

We also hasten to remind the agency that many vehicle manufacturers produce numerous fundamentally different lighting devices for the same year and model vehicle, with the vehicle's trim line, optional equipment and/or production date determining which specific type of device is installed on any particular vehicle. An example is Ford's current full-sized van models, which come from the factory with either an HB5 RBHL system or a Type B sealed-beam headlamp system. Another example is DaimlerChrysler's current Pacifica, which comes from the factory with an H7/H7 reflector/reflector system, an H7/H7 projector/projector system, or a D2S/H7 projector/projector system. Yet another example is the 1990 BMW E30, which came from the factory with either an HB3/HB4 reflector/projector system or a Type C sealed-beam system. In each case (and there are numerous other such examples) these systems are fully mechanically interchangeable, and may be freely replaced with one another with only relatively minor wiring and switching changes to accommodate the different system requirements. It seems inconsistent for NHTSA to bar companies that don't happen to produce whole automobiles from engaging in a practice widespread among companies that do produce whole automobiles, given that vehicle and equipment makers are required by the same statute to adhere to the same Federal Motor Vehicle Safety Standards.

Nevertheless, we understand that in the absence of standardized lighting device form factors, in many cases it is styling rather than performance that drives the aftermarket for lighting devices different from original equipment, and that there is a legitimate need to ensure the continued safety performance of vehicles in use. NHTSA may be able to achieve this without requiring aftermarket devices to be identical in all design respects to original equipment.

The agency may wish to consider a compromise whereby there are no device design restrictions beyond all applicable provisions of FMVSS No. 108, but aftermarket devices, regardless of design, are required to achieve performance in pertinent part no more than e.g. 25% lower than the original equipment it is designed to replace AND must comply with all applicable performance requirements in FMVSS No. 108. The effect of such a requirement would be to restrict the minimum allowable aftermarket device performance to approximately the level of the original equipment, factoring in original device degradation with age and use. The minimum allowable performance requirements present in FMVSS No. 108 would remain in force, but replacement devices would be permitted only a small margin of reduced performance relative to the original devices they replace.

If, for instance, an original equipment device incorporates a stop lamp with a central intensity of 400 cd, a horizontal visibility range of 120 degrees, a vertical visibility range of 80 degrees and a projected area of 2,200 sq. mm, any replacement device would have to incorporate a stop lamp with a central intensity of not less than 300 cd, a horizontal

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visibility range of not less than 90 degrees, a vertical visibility range of not less than 60 degrees, and a projected area of not less than 1,650 sq. mm.

Such "relative minimum allowable performance" (hereinafter: RMAP) requirements might be appropriately applied to most signalling functions, i.e., front and rear sidemarker lamp and retroreflector, rear retroreflector, tail lamp, brake lamp, CHMSL, rear turn signal, backup lamp. Front parking lamps and front turn signals would not necessarily need any RMAP requirements, since the parking lamp and requirements are so easily complied with in many different ways, and there already exist adequate RMAP-type requirements – turn signal multipliers – for turn signals, depending on their physical separation from the low beam headlamps. DRLs may warrant special consideration, since there is considerably more lattitude for compliance with the upper beam photometric specification than for compliance with the upper beam DRL specification and a differently-designed upper beam headlamp may not comply with the axial intensity limit when operated as a DRL, particularly if the agency's DRL glare reduction program proceeds as planned.

Aftermarket headlamps could be made subject to similar RMAP requirements, such that replacement low-beam headlamps, for instance, would be required to produce, relative to the original equipment device, not more than 125% of the intensity in the 0.5U/1.5L to L glare region, not less than 75% of the intensity at the beam peak ("hot spot"), and the 1,000 cd isocontour be not less than 75% as wide.

The agency's second question, regarding function packaging (i.e., grouping) in combination devices, is somewhat easier to tackle. Certainly it is reasonable and proper to require that all functions produced by an original device must be produced by any replacement device. On the other hand, the nature and method of installation of lighting devices has shifted over the years since FMVSS No. 108 was originally drafted. Combination devices, i.e., devices producing more than one function, are considerably more prevalent now than they ever have been, devices are considerably more integrated into the overall construction and styling of vehicles, and signalling devices have tended to increase in physical size over the years to accommodate increasing numbers of mandatory functions and increased minimum-area requirements for many functions. As a result, many devices now span more than one vehicle body component. The obvious example is multiple-part rear combination lamps mounted on the vehicle's quarter panel and decklid, as in the case of the Honda Civic lamps that sparked Calcoast's inquiry.

Some functions are more practicable to regroup or relocate than others. Sidemarker lamps and retroreflectors and rear retroreflectors, for instance, are the only signalling functions still commonly implemented either as part of a combination devices or as separate self-contained devices. Law enforcement personnel are charged with ensuring that vehicles in use are equipped with all required lighting and reflective devices, and this is becoming

much simpler as the trend continues for states to delete outmoded and unenforceably vague lighting codes and incorporate FMVSS No. 108 by reference.

Here again, the agency may wish to consider a compromise position by:

-Defining "set of devices" as a collective term applicable to all devices and/or combination devices providing a group of functions on a single vehicle (e.g. all three components of a 1995 Honda Civic's integrally-styled rear lighting system spanning both quarter panels and the decklid)

-Permitting the aftermarket relocation of sidemarker retroreflector, sidemarker lamp and rear retroreflector functions from a combination device to a separate device not originally present on the vehicle or vice versa

-Prohibiting the aftermarket relocation of functions, other than sidemarker retroreflector, sidemarker lamp and rear retroreflector, from a combination device to a separate device not originally present on the vehicle or vice versa

-Permitting the relocation/regrouping of functions within an aftermarket device or set of devices intended to replace an original set of devices as long as all function positioning requirements of FMVSS No. 108 are met when the device or set of devices is installed as intended

-Requiring that any replacement device, set of devices or replacement component of a set of devices be sold with all components and adaptive equipment necessary to produce all the functions produced by the original device or set of devices

-Requiring that all aftermarket devices, combination devices and sets of devices comply when installed as intended with all applicable performance requirements of FMVSS No. 108 and with any applicable RMAP requirements as proposed above.

Finally, we would like to suggest that NHTSA could very satisfactorily resolve the issues surrounding relocation/regrouping of functions, and could preclude a great deal of marginally compliant equipment that may comply with the letter of the law but not its intent, and prevent the marketing of equipment that reduces the safety performance of vehicles in use, by adopting dimensionally-explicit specifications for the allowable mounting locations of devices and functions. Everybody seems to have a different idea of what constitutes practicability (as in "as far apart as practicable"), and some of these notions appear rather extreme. Calcoast's question about an aftermarket rear combination lamp's placement of the left and right rear retroreflector functions closer together than the original equipment is an example, but not all such examples come from the aftermarket. Consider the 1992 to 1994 Subaru Legacy and 1995 to 1997 Toyota RAV4 vehicles, on which the front sidemarker lamps and reflectors were located behind each front wheel in

the location used in other markets for a side turn signal repeater, well aft of the front of the vehicle. Another example is the 1996 to 1999 Mercury Sable, a wide vehicle on which the front turn signals are considerably closer to the vehicle centerline than to the outboard front corners, yet the parking lamps, with identical 3457A bulbs, are several inches outboard of the turn signals.

In all of these cases, "practicability" appears to have been determined by the manufacturer to mean "convenience" or "desire". NHTSA may wish to consider adopting the dimensionally-explicit device and function location requirements contained in ECE R48H, the working document for a GTR on lighting device installation. With dimensionally-explicit location requirements, all parties affected by the questions currently facing NHTSA – vehicle manufacturers, equipment manufacturers and end users – would have considerably clearer regulations to follow regarding grouping and installation of lighting functions.

Candlepower, Inc. appreciates the opportunity to comment on matters of automotive lighting safety, technology and regulation. Should you wish to discuss any of the contents of this letter in further detail, please do not hesitate to contact me directly.

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